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EXAMINER

PHAM, MICHAEL

ART UNIT	PAPER NUMBER
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2167

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/660,166

Applicant(s)

DAY ET AL.

Examiner

Michael D. Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

1. Claims 1 - 23 have been examined.
2. Claims 1 - 23 are pending.
3. Claims 1 - 23 are rejected as detailed below.

Priority

The application does not claim foreign or domestic priority. Accordingly, the application has been examined with 9/11/2003.

Specification

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: In claim 5, join-from file and join-to file is not disclosed within specifications.

Claim Objections

Claim 1 objected to because of the following minor informality: there appears to be a semicolon on page 22 line 4 where there is meant to be a comma.

Claim 11 objected to because of the following minor informality: there appears to be a typo on page 24 line 15 for the words "an other" and it appears to mean another. Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1 and 5 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. In claim 1, the claim limitation states to “collect performance statistics about each of the join operations” however the collection of statistics about join operations does not provide a tangible result. It is noted that by incorporating claim 2 into claim 1 fixes this problem because the statistical results causes the changing of join orders.

Claim 5 is rejected because claim 5 fails to resolve the deficiencies of claim 1.

Claim 16 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claim limitation states to collect statistic about each of the join operations however does not provide a tangible result. It is noted that by incorporating claim 17 into claim 16 that this fixes the problem because the statistical results causes a preferred join order based on the statistics.

Claims 19-20 are rejected because claims 19-20 fail to resolve the deficiencies of claim 16.

Claims 21-23 are rejected under 35 U.S.C. 101 because claim 21 is directed to non-statutory subject matter. Claim 21 is directed to program per se and non-functional descriptive material,

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see Annex IV pages 55-57. Transmission type media such as digital and analog communication links does not appear to be statutory since no requisite functionality is present to satisfy the practical application requirement. Claims 22-23 fail to resolve the deficiencies of claim 21 and are therefore rejected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1, 11, and 16 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S.

Patent Application Publication 2004/0210563 by Zait et. al. (hereafter Zait).

Claim 1:

Zait discloses, **a method for monitoring a query during runtime, said query involving a plurality of join operations; the method comprising the steps of:**

running the query according to a first join order [0024 and 0003, query is executed according to the one or more operations in an execution plan. Operations may consist of a join order. 0004, discloses determining an optimal join order therefore there must exist other join orders and the most optimal one is selected.]; and

concurrent with running the query, collecting performance statistics about each of the join operations [0024, statistics information is collected from operation which may include join operations.].

Claim 11:

As to claim 11, Zait discloses further comprising the steps of:

running an other query after the query [0024, essentially after finishing a query another query must run. 0026, query is run using execution plan. Further, 0035, after running an execution plan for the optimizer another execution plan is run if the executor and optimizer is different.]; and

selecting an initial join order for the other query based on the collected performance statistics [0024, selects an execution plan for new query.].

Claim 16:

Zait discloses an apparatus for executing a query comprising:

at least one processor[0074, one or more processors];

a memory coupled with the at least one processor[0074, processors execute instructions contained in memory]; and

a database engine residing in memory and executed by the at least one processor, the database engine configured to run a query involving a plurality of join operations according to a first join order [0023-0024. 0023, query statements run by database system. 0024, execution plan is run which contains one or more operations; and therefore a plurality of statistics is collected about the operations. Operations may include join operations.]; and, **concurrent with running the query, collect statistics about each of the join operations** [0024, execution statistics collected. That is, while it is run.].

Claims 2-4, 9-10, 12-15, and 17-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait as applied to claims 1, 11, and 16 above, and further in view of U.S. Patent 5345585 by Iyer et. al. (hereafter Iyer)

Claim 2:

As to claim 2, Zait discloses basing operations on statistics [0035]; however Zait does not explicitly ¹state in great detail, further comprising the step of:

changing the first join order, during running of the query, to a second join order.

¹ Zait however does disclose if execution statistics differ from the optimizer estimates for execution plan then optimizer generates a second execution plan for the query statement based on statistics 0035, which does encompass changing join operations and thus join orders.

However, Iyer discloses optimizing the processing of a plurality of join operations to join relations of a database in conjunction with a computer processing a database query, and rearranging join operations based on lower costs (i.e. statistics) [Col. 7 lines 39-42, col. 5 lines 61-62, and col. 8 lines 57-60].

Both inventions are within the same field of endeavor, which is query optimization. Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include **changing the first join order, during running of the query, to a second join order** based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because by changing the join order to optimally select lower cost plans, it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Claim 3:

As to claim 3, Zait discloses, further comprising the step of:

Zait discloses **collecting additional statistics about each of the join operations** [0031-0032, additional statistics about operations such as counters are collected.]; however, Zait does not explicitly ²state in great detail about the first join order is changed to the second join order.

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (i.e. lower cost, which is a

² See footnote 1.

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statistic.) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).

Both inventions are within the same field of endeavor, which is query optimization. Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include **the first join order is changed to the second join order** based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because by changing the join order to optimally select lower cost plans, it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Claim 4:

As to claim 4, Iyer discloses, further comprising the step of:

changing the second join order to either the first join order or a third join order based on the additional statistics [Iyer further discloses, Col. 6 lines 26-31 and Col. 12 lines 65-67 to col. 13 lines 1-16, additional costs are further compared in a post processing method after join operations are changed. And another join order is identified].

Claim 9:

As to claim 9, Zait discloses , **comprising the steps of:**

identifying a predetermined sample size [0032, sample of execution statistics];

performing the step of collecting statistics for the predetermined sample size [0032];

evaluating the collected statistics [0032, evaluate by adjusting collected statistics]; and

Further, Zait discloses running operations based on statistics [0035]; however Zait does not explicitly ³disclose in great detail **changing the first join order to a second join order**.

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (lower cost) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).].

Both inventions are within the same field of endeavor, which is query optimization. Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include **changing the first join order to a second join order** based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because by changing the join order to optimally select lower cost plans, it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

³ See footnote 1.

Claim 10:

As to claim 10, Zait discloses, comprising the steps of:

collecting additional statistics for substantially all of the query [0032-0033];
comparing the additional statistics with the collected statistics [0032-0033]; and
adjusting the predetermined sample size, for use by a subsequent query, according to results of the comparing step [0032-0033].

Claim 12:

A method for optimizing a query join order during runtime, said query involving a plurality of join operations, the method comprising the steps of:

running the query according to a first join order [0024, running a query based on a selected execution plan]; and

concurrent with running the query, collecting statistics about each of the join operations[0024, statistics are collected during execution]; and

based on statistics, while running the query the query, such that the query continues to run according to the preferred ⁴ join order [0035, an execution statement is run for a query]

However, Zait does not explicitly ⁵ disclose selecting a preferred ⁶ join order.

⁴ Examiner has interpreted preferred to essentially be the least costly or most optimal for the remainder of the action.

⁵ See footnote 1.

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (lower cost) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).

Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include selecting a preferred join order based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because both inventions are directed towards query optimization and execution, and further by changing the join order to optimally select lower cost plans it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Claim 13:

The method according to claim 12, and further discloses comprising the steps of:

Zait does not explicitly disclose the steps of

determining respective fan-in statistics for each of the join operations; and

selecting the preferred join order based on the fan-in statistics.

However, Iyer discloses rearranging joins according to lower costs in Col. 8 lines 58-60, and further discloses that the cost of a sequence of join operations is based on time savings that are obtained when a plurality of join orders using given join methods are joined in a particular order. For example, one criterion for cost determination can be the size of the resulting relations of joins wherein it would be desirable to perform joins that result in smaller tables earlier than joins that result in larger tables later (Col. 9 lines 3-10). That is fan-in and fan-out statistics are measured and the lower cost join is selected.

Therefore it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to have included the steps of

determining respective fan-in statistics for each of the join operations; and

selecting the preferred join order based on the fan-in statistics

based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because both inventions are directed towards query optimization and execution, and further by changing the join order to optimally select lower cost plans it optimizes queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Either way, both inventions are directed towards query optimizations and therefore have motivation to combine.

Claim 14:

Claim 14 is rejected under the same rational as applied to claim 13.

Claim 15:

As to claim 15,

Zait discloses **collecting statistics for a predetermined number of records from a table involved in the query** [Zait, 0024, 0027, 0032, and 0035 in which statistics information collected and utilized for execution plan]. However Zait does not explicitly ⁷disclose **performing the step of selecting a preferred join order after**.

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (i.e. lower cost, which is a statistic) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).

Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include **performing the step of selecting a preferred join order after** based on the disclosure of Iyer. One of ordinary skill in the art would have been

⁷ See footnote 1.

motivated to do so because both inventions are directed towards query optimization and execution, and further by changing the join order to optimally select lower cost plans it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023]. Further, it does not make any sense to select something and call it a preferred join order based on nothing.

Claim 17:

As to claim 17, Zait discloses selecting operations based on statistics [0035]; however Zait does not explicitly disclose in great detail, **wherein the database engine is further configured to select a preferred join order.**

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (lower cost) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).

Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include selecting a preferred join order based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because both inventions are directed towards query optimization and execution, and further by changing

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the join order to optimally select lower cost plans it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Claim 18:

Zait discloses, **wherein the database engine further comprises:**

a manager configured to determine the select the preferred join order [Zait, 0024, execution plan is generated. 0035, Executor and optimizer manage operations.];

an execution engine, coupled with the manager, and configured to execute the query according to the preferred join order [Zait, 0024, selection operation is executed]; and

a statistics collector, coupled with the manager and the execution engine, configured to monitor execution of each of the plurality of join operations, capture respective performance data [Zait, 0024, collection of executed statistics]; and

communicate the respective performance data to the manager [Zait, 0035, changes execution plan based on statistics data.].

Claim 19:

Zait discloses, wherein the statistics include respective fan-in statistics and respective fan-out statistics for each of the join operations [Zait, 0004, selectivity of query predicates may be taken into account when estimating the cost (i.e. statistic) of a particular access method or when determining optimal join order.].

Claim 20:

Zait discloses, the apparatus according to claim 16, wherein the statistics are collected for a predetermined number of records from a table involved in the query [Zait, 0032].

Claim 21:

Zait discloses, a program product, comprising:

program code configured upon execution to perform the steps of:

running the query according to a first join order [0024];
concurrent with running the query, collecting statistics about each of the join operations [0024], and
based on the collected statistics, while running the query, such that the query continues to run according to the preferred join order[0024]; and
a signal bearing medium bearing the program code [0076].

However Zait does not explicitly⁸ disclose, **selecting a preferred join order**.

On the other hand, Iyer discloses initial join order implying that another order may exist [abstract]. Disclosing that there is an identification of a more optimal (lower cost) join order for the join operations given the current assignment of join methods (col. 8 lines 58-60). And further discloses that the optimal join order is selected based on a given selection of join methods (Col. 9 lines 38-40). Thereafter, given a join order the optimal join methods are selected (Col. 9 lines 38-40).

Therefore, it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait to include **selecting a preferred join order** based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because both inventions are directed towards query optimization and execution, and further by changing the join order to optimally select lower cost plans it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023].

Claim 22:

Claim 22 contains similar limitations to claim 13 and is therefore rejected on the same bases as claim 13.

⁸ See footnote 1.

Claim 23:

Claim 23 contains similar limitations to claim 14 and is therefore rejected on the same basis as claim 14.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zait in view of Admitted Prior Art in Background of Specifications (hereafter Background).

Claim 5:

Zait discloses **the method according to claim 1**, however does not explicitly disclose in detail **wherein the plurality of join operations include:**

a first join that includes a join-from file and a first join-to file;

a second join that includes the join-from file and a second join-to file.²

However, the background discloses on page 4 lines 7-13 that a plurality of join operations may include joining of tables A->B->C and A->C->B which is similar to joining X->Y and X→Z.

Therefore it would have been obvious to one of ordinary skill at the time of the invention was made to have included the a plurality of join operations where a first join includes a join-from file and a first join-to file and a second join that includes the join-from file and a second join-to file, based on the disclosure of the Background. One of ordinary skill in the art would have been

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motivated to do so because both the Background and Zait are directed towards optimizing query plans and that join operations involve join ordering to optimize query plans [Background, Page 4 lines 7-8]. Lastly, Zait utilizes statistics from operations such as joins to produce query plans as seen in 0035 and 0027 therefore to combine the two would have been obvious to achieve a common goal of optimizing queries.

Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait and Background further in view of U.S. Patent 5345585 by Iyer (hereafter Iyer).

Claim 6:

Zait and Background disclose the method according to claim 5, however they do not explicitly disclose further comprising the steps of:

determining respective fan-in statistics for the first join and second join; and

changing the first join order to a second join order if the respective fan-in statistics indicate that the second join is more likely to cause fan-in than the first join.

However, Iyer discloses rearranging joins according to lower costs in Col. 8 lines 58-60, and further discloses that the cost of a sequence of join operations is based on time savings that are obtained when a plurality of join orders using given join methods are joined in a particular order. For example, one criterion for cost determination can be the size of the resulting relations

⁹ Examiner has interpreted claim 5 first and second join-from and join-to files to be equivalent to joining

of joins wherein it would be desirable to perform joins that result in smaller tables earlier than joins that result in larger tables later (Col. 9 lines 3-10). That is fan-in and fan-out statistics are measured and the lower cost join is selected.

Therefore it would have been obvious to one of ordinary skill at the time the invention was made to have modified Zait and the Background to have included the steps of

determining respective fan-in statistics for the first join and second join; and

changing the first join order to a second join order if the respective fan-in statistics

indicate that the second join is more likely to cause fan-in than the first join

based on the disclosure of Iyer. One of ordinary skill in the art would have been motivated to do so because all inventions are directed towards query optimization and execution, and further by changing the join order to optimally select lower cost plans it improves queries and join operations [Iyer, Col. 7 lines 10-13 and Col. 7 lines 39-42]. This is essentially the same goal as Zait which is collecting statistics (i.e. costs) to improve performance in query operations [0023] and further satisfying the Background in optimizing query plans having join operations involving join order [Background, Page 4 lines 7-8].

Claim 7 is rejected under the same rational as applied to claim 6.

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Claim 8 is rejected under the same rational as applied to claim 6.

Conclusion


The prior art made of record listed on PTO-892, and not relied upon, if any, is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael D. Pham whose telephone number is (571) -272-3924. The examiner can normally be reached on Monday - Friday 8am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) - 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael Pham
Art Unit 2167
Examiner
03/27/2006


Debbie Le
Art Unit 2168
Primary Examiner
03/27/2006

